THE EFFECT OF PARTICIPATION IN ADVANCED PLACEMENT AND/OR DUAL CREDIT ON FOUR-YEAR GRADUATION RATES

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Advanced Placement and dual credit programs are designed for high school students and are used to earn college credit and possibly gain college admissions advantages. The present research examined the impact of participation in one or both programs on four-year college graduation rates. Findings indicated significant differences between the programs as well as with students who did not participate in either program. Students in AP achieved the highest four-year graduation rate, followed by students in dual credit, both programs, and neither program. These findings indicate the need for further study to determine whether the programs substantially contribute to four-year graduation rates and what the implications are.

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INTRODUCTION

Postsecondary institutions are breaking all-time records for enrollment growth as the population increases. Between 1995 and 2005, the college-age population (18-24 years) in the U.S. increased by 15% while the college enrollment rate increased by 23% during this same period (National Center for Education Statistics [NCES], 2008). In fact, college enrollment during this period exceeded the projected record number of 18 million students in the fall of 2007 and another 14% increase is projected by 2016 (NCES, 2008). Despite record-breaking enrollment, many students and educators face the challenges of ensuring not only success following enrollment, but retention of students through graduation. While 75.5% percent of college freshmen return for their second year (National Center for Higher Education Management Systems Information Center Progress and Completion, n.d.), only 57.3% will graduate within six years and only 36.2% will graduate within four years (Knapp, Kelly-Reid, & Ginder, 2009). Furthermore, according to American College Testing [ACT] (2008), a mere 22% of college freshmen are prepared for college level work in all four critical subjects of math, English, reading, and science. Students who are not college-ready are at risk for attaining less success in college, taking a longer time to graduate, and dropping out prior to graduation (Attewell, Lavin, Domina, & Levey, 2006). In order to increase the rates at which their students achieve success and are retained until completion, there must be a comprehensive understanding of effective preparatory curricula.

National, state, and local parties have implemented many programs aimed at increasing student success and retention, providing both indirect and direct services. Direct service programs, such as Advanced Placement (AP) and Dual Credit provide academic preparation to secondary level students with the intention of better preparing them to successfully graduate

from a university. There has been research examining the individual impact of these programs on college credit, admissions, and student performance, although results of different studies often conflict with each other, and no conclusion has yet been drawn (Adelman, 1999; Dodd, Fitzpatrick, De Ayala, & Jennings, 2002; Geiser & Santelices, 2004; Lichten, 2000; Oxtoby, 2007).

Overview of Advanced Placement

AP programs were designed by the College Board in 1955 with the goal of giving advanced high school students an opportunity to earn college credit while still in high school by taking AP courses and exams. The program has grown over time, and has come to be identified as a 'marker' for college readiness. Today, successful completion of AP courses and/or exams are used to determine college placement and credit, and sometimes, even college admission. There are currently 37 AP courses and exams across 20 subject areas (College Board, 2008a). Howard-Vital (2006) reports that AP courses are offered in 60% of American high schools and are considered for credit or admission purposes at over 90% of American colleges. Due to the large volume of AP courses and the weight of consideration given to AP courses and exams by post-secondary institutions, it is imperative that information regarding the subsequent college success of students who participated in AP programs become available. College success may be defined in a multitude of ways, and frequently includes variables such as GPA, academic progress, and graduation. Research regarding college success following one or more AP courses in high school indicates mixed results. Some researchers report that students who took AP in high school achieved more success in college than those who did not (Adelman, 1999; Dodd, Fitzpatrick, De Ayala, & Jennings, 2002; Hargrove, Godin, & Dodd, 2007), while some researchers report that students who took AP in high school are no more successful in college

than those who did not (Geiser & Santelices, 2004). Additionally, some researchers report that AP programs are actually detrimental to success for some students (Oxtoby, 2007), while others report that program impact on college success depends on the AP program that the student participated in (Lichten, 2000). Furthermore, research has typically focused on specific issues such as how many AP courses were taken, what AP exam scores were achieved, or college credit achieved rather than the overall effect that AP programs have on college success. Because the College Board (2008b) clearly states that AP courses are intended to teach students not only the subject matter, but to prepare students for college level work by teaching them to "read texts critically, solve problems analytically, and write clearly," it follows that students who participated in AP courses would be better prepared for college, and therefore achieve better success rates than their peers who did not participate in AP courses.

Overview of Dual Credit

Unlike AP courses, dual credit courses are not uniformly governed by a central agency, such as the College Board. Dual credit courses are college-level courses that high school students take to earn both high school and college credit. Dual credit programs can be difficult to evaluate on an overall scale due to the individual administration of these types of programs. Dual credit programs began to gain popularity in the 1990s, though they have been in existence since the 1950s (Andrews, 2000). The latest information from NCES (Waits, Setzer, & Lewis, 2005) indicates that dual credit courses are offered in 71% of public high schools, and that 1.2 million students participate in the programs. Andrews (2004) states that the reason for the increasing popularity of dual credit programs is twofold: first, many students have exhausted most of the academic credits they need for college by their senior year of high school, and often take "filler" credits during the last year. Dual credit programs can fill the gap between the last year of high

school and postsecondary education. Second, dual credit courses offer the opportunity to shorten the amount of time it takes to earn a baccalaureate degree, which now averages five to six years. In addition, the offering of dual credit courses is economically efficient for the participating state. In Texas, for example, school districts are now required to offer at least twelve hours of dual credit. An overview of dual credit from the Texas Higher Education Coordinating Board [THECB] (2008a) indicates that the benefits include accelerating time to graduation, therefore freeing up both space and faculty at institutions for new students to come in, and graduates entering the workforce sooner. There are many potential benefits to participation in dual credit programs but it is unclear whether students are actually reaping these benefits. Studies that are currently available typically focus on success defined by narrow parameters, such as specific programs or schools or college enrollment (Andrews, 2000; Andrews, 2004; Marshall & Andrews, 2002; Smith, 2007). Due to the increasing population and college-going rate as well as the average time-to-degree (five to six years), it has become very important to evaluate whether dual credit programs provide benefits to students with regard to overall college success.

Theoretical Orientation

A comprehensive look at whether student participation in these programs (AP and/or dual credit) predicts higher rates of college success amongst each other and relative to their peers who did not participate is needed. College success may be defined by many different measures, however, for the current research, success is defined as graduation within four years. Adelman (1999) indicates that researchers studying higher education should focus on the ultimate goal of graduation when defining success. There are undoubtedly myriad contributors to a student's success, but the goal of college, particularly for students coming in from high school, is graduation. Therefore, research may benefit from an orientation toward defining success as

graduation. There is little research that examines these programs as a whole rather than breaking them down into small parts that purportedly predict success (i.e. specific courses, exam scores, etc.). It is important to consider the programs as a whole for two reasons. First, increasingly large numbers of students participate in AP courses without taking the exams at the end of the courses (Geiser & Santelices, 2004). Second, the goals of AP and dual credit programs include college preparation and reduced time-to-degree, and state that participation is advantageous to subsequent college success.

The approach that is overwhelmingly represented in the literature is one of academic participation, defined by Kuh, Douglas, Lund, and Ramin-Gyurnek (1994) as "satisfactory compliance with explicit norms such as earning passing grades and the normative academic values of the institution." This paper will use the academic participation approach, though this paper will examine participation in the programs as a whole rather than achievement of certain objectives in the programs (such as exam scores or number of courses taken). This approach will help determine whether participating in college preparatory activities such as AP and/or dual credit programs is indicative of higher four-year graduation rates in relation to peers that did not participate in these programs. Four-year graduation as a determinant of success for this research project was selected for its relation to the stated goals of AP and dual credit programs. AP and dual credit programs are geared toward college success. Graduation rates are a clear indicator of whether the ultimate success is achieved by students who participated in one or both programs. AP and dual credit programs state that through participation, students may have a shorter time-to-degree. Since the average student now takes five to six years to earn a baccalaureate degree, it is important to determine if students who participated in AP and/or dual credit programs are earning degrees in less than six years. Nationally, 36.2% of students earn a baccalaureate degree

within four years (Knapp, Kelly-Reid, & Ginder, 2009). In Texas, the four-year graduation rate is 25.3%, and at the institution where this research will be conducted, it is 21.7% (THECB Accountability System, 2009). This paper will examine the main effect of program participation by four-year graduation. Students who participated in AP and/or dual credit programs are expected to be more successful with regard to four-year graduation than their peers who did not participate.

LITERATURE REVIEW

Advanced Placement

History and Present Use

Advanced Placement (AP) programs provide college-level courses to high school students. The courses are taught by high school teachers, who design the syllabi and teach the course at a college-level (Clemmitt, 2006). The students are given the opportunity to take an AP exam at the end of the course, and if they score high enough, they may be granted college credit (each college sets its own scale for what score is needed for credit). In addition to credit assignment, AP courses are also used in admissions decisions, and so even without taking the AP exam, students may benefit with regard to admission, and may also benefit through the experience of a college-level course.

AP was originally intended to provide advanced students who planned to attend selective colleges with the opportunity to earn college credit while in high school (Clemmitt, 2006). The program was designed for high school juniors and seniors, and was intended to fill "empty" credit hours with college-level courses. From the 1930s to the 1950s, educators became concerned that gifted students were not being adequately prepared for college during high school due to unchallenging curricula and boredom (Clemmitt, 2006). To address this concern, AP programs were created in the early 1950s by the Ford Foundation. Initially, only 12 high schools and 12 colleges participated, offering college credit based on exam scores in 11 different subject areas. In 1955, College Board assumed responsibility for the AP program, and began offering the program nationally. By 1956, 110 high schools and 138 colleges had students who participated in the AP program. The AP program continued to grow during 1980s and 1990s, when American students began to lag behind their international peers in academic performance. This created a

national push for academic access and success, and in 2007, students from 16,464 high schools attending 3,743 colleges and universities participated in AP programs (College Board, 2007). Currently, there are 37 AP courses and exams offered in 20 subject areas (College Board, 2008a). Policy-makers, educators, and students have come to consider AP program participation as indicative of high potential to be successful in post-secondary education. Actions taken by colleges and universities, high schools, and government officials to increase participation in AP all reflect this point of view.

Since its inception in the 1950s, the use of AP by students and colleges has changed (Clemmitt, 2006). AP is now considered not only for credit and placement, but as an indicator of college readiness. The push for AP is evidenced by increasing endorsement from state officials and school leaders, as well as by its inclusion in state and federal educational policy (Kyburg, Hertburg-Davis, & Callahan, 2007). Over the past 10 years, millions of dollars in federal and state funds have been used to increase AP enrollment and exam participation, especially for low-income and minority students. During the movement to increase college access and success in the 1980s and 1990s, colleges across the U.S. began to use AP as a consideration in admissions decisions (Clemmitt, 2006). Today, AP is used by most colleges during the process of admission (College Board, 2008c), and more than 90% of colleges and universities offer placement and/or credit based on AP exam grades (Howard-Vital, 2006). AP exam scores have been used since the inception of the program to give college credit. A score of 3 (out of 5) or better is typically used for credit assignment, although some schools, especially selective schools, require a 4 or better in order for a student to receive credit (Lichten, 2000). When used for admission consideration, it is typically participation in AP courses rather than exam scores that is considered (Lichten, 2000; Tai, 2008). Compounding the weight of AP participation in admissions decisions, some high

schools give an additional GPA point for success in AP courses, giving students the chance to earn up to 5.0 GPA points (rather than the traditional 4.0). Some colleges have also adopted the practice of assigning 'merit' GPA points to high school transcripts for students who took AP courses (Lichten, 2000). When used by colleges, this additional GPA point is used for admissions evaluation purposes; a practice which ranks AP participants higher on the list of students worthy of admission than students on a 4-point scale. The adoption of AP consideration for admissions and college credit; the endorsement of AP by political and educational leaders; and the funding of AP participation by the federal and state governments all indicate a widespread belief that AP is beneficial to college-bound students. However, the literature presents mixed results with regard to this claim.

Overview of Previous Findings

Findings in support of AP programs were presented by Adelman (1999), by Dodd, Fitzpatrick, De Ayala, and Jennings (2002), and by Hargrove, Godin, and Dodd (2007). Adelman (1999) conducted research for the U.S. Department of Education regarding academic factors related to bachelor's degree attainment. Adelman (1999) reviewed high school and college transcripts, test scores, and surveys from a national cohort of students who were in the 10^{th} grade in 1980. He reviewed these records through 1993, providing a snapshot of 10^{th} grade through 11 years post-high school graduation. This snapshot was examined for bachelor's degree attainment (at any point in the 11 years post-high school), and the factors leading to that attainment. Results indicated that high school curriculum, more than test scores, rank, or GPA, predicted greater success in college and greater rates of bachelor degree attainment. Furthermore, these results appear to be more pronounced for African American and Latino students than for other ethnic groups. This is important because these groups typically underperform when compared to their

peers of other racial/ethnic origins (KewalRamani, Gilbertson, & Fox, 2007). The largest gaps in educational attainment occur between Caucasians and African Americans and Hispanics. Between 1990 and 2005, the gap closed somewhat between Caucasians and African Americans, but the largest gaps are still present between Caucasians, African Americans, and Hispanics. Interestingly, Adelman (1999) also found that AP courses were more strongly correlated with actual bachelor degree attainment than with college access. In 2002, Dodd et al. (2002) conducted a College Board study, and found that students who received credit for AP courses earned the same, or higher, grades than did their peers who did not participate or who did not receive credit. The study by Dodd et al. (2002) was conducted using freshman cohorts from 1996-1999 whom not only participated in AP programs, but who took the appropriate follow-up courses at the University of Texas, Austin campus. While this study appears to support AP programs, it does not consider the overall performance, but rather the subsequent college grades, of students who participated in AP programs. Hargrove, Godin, and Dodd (2007) conducted a College Board study using data from four cohorts (1998-2001) of Texas high school graduates who attended higher education institutions in Texas. They considered students who participated in AP courses only, exams only, or both, in comparison to each other and to other students who participated in dual enrollment courses and other courses. They used outcome variables of first and fourth year GPA, first and fourth year credit hours earned, and four-year graduation status. They found that students who participated in both AP courses and exams performed significantly better than all other groups with regard to all outcome variables.

Findings have also been reported that have found no significant difference in the academic performance of students who participated in AP programs and other honors programs versus those who did not participate. In one of the largest studies of students who participated in

AP programs (or other honors programs) to date, Geiser & Santelices (2004) found no benefit to participating students. Their study sample was comprised of 81,445 freshmen from four years (1998-2001) attending college in the University of California System. The researchers examined test scores, high school curriculum information, parental income and education information, campus of enrollment, and major. However, they found that the number of AP (or other honors) courses taken was not related to students' college success. It is noteworthy that they did find that AP exam scores were positively correlated to college success, but concluded that since many students take AP courses and not AP exams, that the use of AP in admissions decisions is not an appropriate indicator of a student's potential for success.

Oxtoby (2007), in his review of AP program literature and trends, posits that AP programs may actually be detrimental to students. His concerns include the passing-over of basic skills courses in favor of AP courses and that AP programs have become another victim of "teaching to the test." Lichten (2000) reviewed the AP program, and concluded that benefit may be dependent upon the program attended, and that racial/ethnic minorities and low-income students are at a particular disadvantage if this is the case, due to inequities in educational opportunity. Lichten (2000) also concluded that as AP programs were designed, for an elite group of advanced students, they are not suited for the average student and need to undergo considerable reformation with the current uses of AP programs in mind.

Discussion of Issues in the Literature

Access and the Opportunity Gap. Policy-makers and educators have lauded AP programs as a means to increasing access and success to college, particularly for historically underserved students (Kyburg, Hertburg-Davis, & Callahan, 2007). There are sharp disparities in the educational opportunities provided to students from high socio-economic backgrounds and those

from low socio-economic backgrounds and also among students who belong to racial/ethnic minority groups (Easton-Brooks & Davis, 2007; Geiser & Santelices, 2004; KewalRamani, Gilbertson, & Fox, 2007; Kyburg, Hertburg-Davis, & Callahan, 2007). Geiser & Santelices (2004) articulated the AP-related problems that the educational gap can cause with their observation that schools with high college-going rates and more funding offer more AP courses than schools that are under-funded and have lower college-going rates. As a result, college emphasis on AP courses as an indicator for admission qualification reduces the chances of admission for students with less access to AP courses. Schools in low socio-economic areas and/or serving large numbers of minority students typically have less qualified teachers, more overcrowded classrooms, and less money to fund programs such as AP than other schools (Easton-Brooks & Davis, 2007; Geiser & Santelices, 2004). The disparity in opportunity described above is a great concern for students, parents, secondary and post-secondary educators, and policymakers, especially given the use of AP courses and/or exams for admissions purposes. The use of AP participation as an indicator of potential to succeed in college inherently places certain students at a disadvantage because many low-income and minority students have less opportunity to participate in AP programs, which may have a negative impact on their access to college. High schools that offer a large volume of AP courses are often considered to be of a higher quality than other schools, and therefore, students attending these schools are frequently considered to be more qualified for college than their peers at schools that offer fewer AP courses (Geiser & Santelices, 2004). Additionally, many high schools and some colleges offer an additional or "merit" grade point toward the student's high school GPA for AP courses. As stated earlier, this provides another competitive edge that low-income and/or minority students with limited or no access to AP courses do not have due to unequal access to such opportunities. This

situation is illustrated by the fact that the University of California has been charged with using discriminatory admissions policies by six civil rights unions representing African American, Hispanic, and Filipino American students. The suits were filed citing discrimination due to the extra GPA points available to students who participated in AP courses, as racial/ethnic minorities have less access to AP programs than the racial/ethnic majority (Lichten, 2000). Reduced access to AP is damaging even without considering judgments made on high school quality and grade inflation via GPA. Many colleges, such as those in California, consider *enrollment* in AP courses, not only exam scores. This results in a reduced opportunity for competitiveness in admissions for low-income and/or minority students (Lichten, 2000). The use of AP participation in admissions can cause colleges to unintentionally discriminate against low-income students and/or minority students, based on judgment of high school quality, GPA inflation, and the educational opportunity gap.

The efforts made to increase college access via AP availability and participation have the potential to drive high schools to provide better educational opportunities. Geiser and Santelices (2004) note that AP program use in university admissions, particularly for leading public universities, can positively affect secondary education by putting pressure on schools to upgrade their curricula offerings and quality of instruction. There are obvious challenges to this idea; primarily those detailed in the discussion above regarding the educational inequality between high socio-economic and low socio-economic schools. The drive to increase AP participation and the use of AP participation in admissions decisions have impacted the provision of secondary educational opportunity, but not quite in the way that Geiser & Santelices (2004) originally envisioned. Social capital is a concept used by many researchers to describe the knowledge contained within a family that provides social advantage. Kyburg, Hertburg-Davis,

and Callahan (2007) narrow the definition to specify the knowledge that students need to successfully navigate the path of higher education. Upper and middle class students have more social and economic capital than their peers from lower socio-economic backgrounds. Often, the parents of upper and middle class students are familiar with the educational system and its processes (Kyburg, Hertburg-Davis, & Callahan, 2007). They are able to advocate for increased opportunity, including AP programs, and they are savvy enough to seek out schools that offer the opportunities that will set their children apart. In an effort to keep a competitive edge, upper and middle class students and their parents select high schools based on the number and availability of AP courses (Geiser & Santelices, 2004). These parents and students are trying to do what is best for their families; however, they may be unintentionally increasing, or at least maintaining, the divide between class and race/ethnicity as well as sacrificing the quality of education in their own schools. These actions have two primary impacts that potentially increase or maintain the social and racial/ethnic division in educational opportunity. First, in choosing to send students to schools selected on the basis of AP offerings, they are choosing to provide funding to schools that are likely already of high socio-economic status. Consequently, this removes funding from schools that are already under-funded, which reduces the financial base needed to improve these schools. Second, combining the funding allocation above with increasing demand at select schools draws high quality teachers to those select schools. AP administration is not strictly regulated across schools, and this may be another factor in the educational opportunity gap. College Board offers workshops and seminars for AP teachers and also requires syllabi to be submitted. However, they do not require any special training or certification for AP teachers (Howard-Vital, 2006). This gives teachers more freedom in the classroom, but can be a disadvantage to students attending low socio-economic schools. Due to the general tendency for

low socio-economic schools to employ less qualified teachers and to have higher student-to-teacher ratios, AP programs at low socio-economic schools may be taught at a different level than AP programs in more affluent schools, thus widening the learning opportunity gap (Lichten, 2000). The select schools have more economic influence and can better recruit and retain high quality teachers. These two impacts, however unintentional, pull funding from the schools that are struggling to provide more educational opportunity while also making it more difficult for them to provide quality instruction. The potential effect of these combined impacts is an increase, or at least maintenance, of socio-economic and racial/ethnic inequality in secondary and post-secondary educational opportunity. KewalRamani, Gilbertson, and Fox (2007) note that lower educational attainment results in reduced quality of life and impacts future earnings and employment opportunities. These outcomes are especially important with regard to racial/ethnic minorities, in particular, African Americans and Hispanics, who achieve far less educational attainment than Caucasians and Asians. Therefore, while the desire to increase the number of AP courses and exams taken by college applicants has the potential to motivate schools to become better, it may prove more difficult for low socio-economic schools to accomplish the same goals regardless of motivation.

Due to the reasons detailed above, the federal and state governments have redoubled efforts to provide equality in educational opportunity, especially with respect to AP programs. Achievement of this objective will increase AP programs offered and the quality of those programs among underserved populations, as well as help achieve the goal of greater access and success to a college education for more students. There are a variety of efforts being made to create a more level playing field for all students with regard to college admissions. For example, the state of Texas recently considered a “uniform GPA” policy, meaning that extra points for AP

programs (and other programs, such as dual credit) may no longer be awarded (THECB, 2008b). Though the "uniform GPA" policy was ultimately not enacted in Texas, consideration of such policy changes indicates orientation toward increased access for all students. Direct efforts are also being made to provide more learning opportunity to students in low socio-economic schools. In 1998-1999, the federal government allocated $7M to increase minority participation in AP programs and to help low-income students pay AP exam fees (Kyburg, Hertburg-Davis, & Callahan, 2007). In 2002, AP programs were incorporated into the No Child Left Behind Act (NCLB) and schools were able to compete for grant funding for programs that increased the number of minority students taking and succeeding in AP courses (Kyburg, Hertburg-Davis, & Callahan, 2007). Shortly after the addition of AP programs to NCLB, former President George W. Bush allocated $52M to fund AP and similar programs in an attempt to increase college access and success, especially for low-income and minority students (Kyburg, Hertburg-Davis, & Callahan, 2007). These efforts have been successful at increasing low-income and minority participation in AP programs; however, low-income and minority participants still lag far behind Caucasian students and students in higher income areas with regard to AP exam scores. For example, in 2008, 63% of Caucasian participants scored as at least 'qualified' in the exam subject area with a score of 3 or better on AP exams, but only 26% of African American students scored a 3 or better (College Board, 2008c). Increasing participation in AP may increase access to college due to admissions policies, but does it increase success in college?

Success and Academic Intensity. College Board (2008b) states that AP courses do more than teach a subject; they prepare students to successfully complete college-level work. This indicates that participation in AP, regardless of exam score, is beneficial to students and helps to prepare them for college. This claim is supported directly by Hargrove, Godin, & Dodd (2007),

who conducted a College Board study and found that student participation in AP, even without taking AP exams, was indicative of increased success when compared to peers who did not participate. Indirect support is provided by many researchers who have found that participation in a challenging high school curriculum indicates college readiness and success (Adelman, 1999; Clemmitt, 2006; Horn & Kojaku, 2001). Given the preferential treatment (both in admissions and in placement and/or credit awarded) of students who have participated in and/or succeeded in AP courses and exams, it is also the assumption of many college admissions offices that AP prepares students for college level work.

In 1999, Adelman conducted a study for the U.S. Department of Education which found that the 'academic intensity' of the high school curriculum was the most important contributor to preparation for undergraduate work. Adelman (1999) further noted that test scores, class rank, and GPA pale in comparison to the quality and intensity of the high school curriculum when considering a student's readiness for college-level work. In 2001, the U.S. Department of Education released a statement directly regarding AP that supported Adelman's (1999) findings, and added that students who challenge themselves with AP courses outperform their peers, regardless of family or economic background. These findings indicate that programs such as AP that increase the curricular offerings of a school should be effective at preparing more students to succeed in earning a bachelor's degree.

Current Trends and Implications. The push to use AP to increase access and success has had an unintended effect on trends in AP. Students are not only taking more AP courses than in the past, but are taking them earlier than in the past (Oxtoby, 2007). This trend is driven by the use of AP in college admissions, placement, and credit; prior to the expanded use of AP by colleges, students took AP courses in the last year, or possibly the last two years, of high school.

Students have begun to take AP courses as early as the ninth or tenth grade in an effort to gain an edge in college admissions through high levels of AP participation, to earn as many college credits as possible, or both (Oxtoby, 2007; Tai, 2008). The knowledge that AP programs are considered when colleges make admission decisions gives students a tangible incentive to participate in challenging coursework provided by AP programs (Geiser & Santelices, 2004). By participating in a greater number of AP courses, students know that they are increasing their competitiveness in the admissions process (based on AP participation only). By taking a high number of AP exams (and scoring highly enough), students have the opportunity to earn a high number of college credits—it is possible to achieve sophomore status before ever arriving on campus (Clemmitt, 2006; Geiser & Santelices, 2004; Oxtoby, 2007; Tai, 2008). On the surface, this trend seems like a positive occurrence and appears to be encouraging. If AP has been the target of increased participation efforts and students are taking advantage of the opportunity to participate in more AP courses than previously available, it is easy to draw the conclusion that the efforts have been successful. The implications of this trend must be critically considered if colleges are to continue rewarding students (via preferential admissions and credit assignment) for taking high numbers of AP courses and/or exams.

Researchers have begun to examine the trends of taking high numbers of AP courses, often at early grade levels. They have expressed concerns about the quality of secondary education that students, both AP and non-AP, receive amidst the popularity of enrollment in high numbers of AP courses (Clemmitt, 2006; Lichten, 2000; Oxtoby, 2007; Tai, 2008). The primary concerns are that students are sacrificing learning basic skills in order to pursue high numbers of AP courses and that teachers are "teaching the test" rather than ensuring understanding and mastery (Clemmitt, 2006; Hammond, 2008; Oxtoby, 2007; Tai, 2008).

AP courses are designed to be college-level courses, and as such, are meant to be taken following a firm grasp of the basic skills in the corresponding subject. If students are taking AP courses in 9th or 10th grade, the basic skills needed for college-level courses may not have been adequately developed. Concern regarding students' readiness for AP courses (and subsequently, college) is not unfounded. ACT (2008) reported that only 22% of college freshmen are fully prepared for college. College Board (2008c) reported that in 2007, 24.9% of high school students took at least one AP exam and according to Geiser & Santelices (2004) far more take AP courses without taking AP exams. Given that only one AP exam is passed for every three courses taken (Lichten, 2000), it is imperative that researchers examine AP participation (as opposed to exam scores) as a variable of college readiness. Lichten (2000) notes that AP courses are well-suited for only a small number of advanced students, while average students are better suited for college introductory/preparatory courses, and below-average students are better suited for remedial courses. High expectations should be communicated to students, and high achievements may be best attained if students are given a firm basis for learning at their most well-suited level. As noted above, colleges often base admissions preference to AP students on participation rather than exam scores. Aside from socio-economic and racial/ethnic concerns, this situation may indicate a flawed admissions process, and has the potential to cause a cascade of events. By giving admissions preference to students who are not necessarily ready for college-level work, colleges may be overlooking students who did not take AP courses or exams, but participated in regular curriculum classes. These overlooked students may be as prepared or more prepared for college-level work than some of their peers who participated in AP programs. Additionally, if colleges are extending preferential admissions to students who are not college-ready, they may need to offer more remedial classes and students may take longer to graduate (when AP should,

in fact, be shortening the time to graduation). This has the potential to decrease college capacity and increase economic burden for students, colleges, and local, state, and federal governments. Oxtoby (2007) observed that modeling high schools after colleges does not provide students with the best possible education, nor does it give students the preparation needed for actual college work. This again emphasizes the need for research regarding the effects, both intended and unintended, of program participation.

Tai (2008) suggests that even students who score well on AP exams may not be prepared to advance past freshman level college courses based on instructional and assessment differences in high schools and colleges. Introductory courses in college are often more comprehensive and are able to more thoroughly assess content mastery than AP courses taught in high school. The AP exams can only test a small amount of information covered in the course, and frequently test memorized information rather than deep understanding (Clemmitt, 2006; Hammond, 2008; Oxtoby, 2007; Tai, 2008). Underlining this point, AP teachers often rush through the syllabus and then use several weeks at the end of the semester to coach students for AP exams (Clemmitt, 2006; Hammond, 2008; Oxtoby, 2007; Tai, 2008). However, as Clemmitt (2006) articulates, the AP exam may serve as incentive for teachers and students to better teach and learn material because no one is sure what is and is not on the test. Regardless of which side of the argument about AP exams one agrees with, one thing is clear; more research is necessary to determine the efficacy of AP courses and exams in relation to college readiness.

Need for Further Study

The use of AP courses and exams by colleges; federal and state funding of AP; and the endorsement of AP by state and educational professionals all indicate that AP does contribute to both college access and success. Increased college access as a result of AP is a step in the right

direction; however, unless students are also able to achieve greater success once they are in college, AP is not fully meeting its stated goals (College Board, 2009). Oxtoby (2007) clearly highlights this concern in his statement that "it is important not to confuse…competitive advantages in the admissions and enrollment process with advantages in actual academic performance—or with advantages in completing a college degree" (p.45). Determining whether AP programs meet their stated goals and whether students who participate in AP programs are more successful than their peers has implications not only for high school curricula, but for college admissions, college credit assignment, and higher education policy.

Dual Credit

History and Present Use

Dual credit programs provide high school students with the opportunity to earn both high school and college credit for college level courses (Karp & Hughes, 2008). Dual credit courses may be taught by either high school teachers or by college professors, and may be provided on either a high school or college campus. Dual credit courses are typically available only to high school juniors and seniors, and unlike AP, are taught from college syllabi (as opposed to college-level syllabi developed by high school teachers). There are no qualifying exams at the end of dual credit courses—the student is given college placement and/or credit based on his or her earned grade in the course.

The concept of dual credit programs is similar to that of AP programs; however, there are distinct differences. One important difference is that while AP courses are offered in many subject areas, dual credit courses are usually only offered for courses that are required for all associate and baccalaureate degrees, which enhances the transferability of courses (Andrews, 2004). Another major difference is that there is no central governing agency (such as College

Board for AP) that organizes dual credit. Dual credit programs are usually established and administered by community colleges or universities and local high schools (Andrews, 2000). Some states mandate dual credit, and may even set forth general requirements and guidelines; however, dual credit programs are far from state-run. For example, the state of Texas requires that secondary schools offer at least 12 credit hours via dual credit programs; however, it is up to local school districts and colleges/universities to govern and administer the programs (THECB, 2008a). In 2001, Andrews reported that all 50 states offer or support dual credit programs; forty-four states have state legislation supporting dual credit, and the other six states support dual credit through individual educational systems. In sum, while the goals of AP and dual credit courses are similar, the programs are very different in scope and function.

Dual credit programs have been in existence since the 1950s, though they increased rapidly in popularity and number nationwide in the 1990s (Marshall & Andrews, 2002). For example, in Texas alone, dual credit enrollment increased by an astounding 444.5%, or 50,989 students between 1999 and 2007 (THECB, 2008a). The increase in dual credit program offerings coincided with the increase in AP programs and courses. These increases took place for many of the same reasons; professional observations of a "wasted" senior year of high school and the baccalaureate time-to-degree, averaging five to six years (Andrews, 2004). The potential benefits to be gained from dual credit programs include a smoother transition to college and reduced cost of a college degree by creating the opportunity for students to graduate in a shorter time.

Overview of Previous Findings

Research on dual credit programs is similar to that of AP programs, with many of the same issues, concerns, and potential benefits cited. The themes of access, success, and the opportunity gap are prevalent in examinations of dual credit, as they are in AP research.

Research regarding dual credit programs is much more limited in quantity and scope than that of AP, however, and as such, needs more contribution. Due to the independent administration of dual credit programs, it is difficult to examine historically, and much research focuses on individual programs (Andrews, 2004; Marshall & Andrews, 2002; Smith, 2007). Presented here are the findings from available research regarding dual credit programs.

Andrews (2004) found mixed results in his examination of several programs. He examined seven individual dual credit programs, and found that dual credit was either successful at achieving its stated objectives or created little or no difference among participants and non-participants. Interestingly, Andrews (2004) found that in one of the programs examined, the majority of dual credit participants reported that they felt 'good' or 'excellent' in their preparation for college resulting from program participation. In another study, Marshall and Andrews (2002) examined one dual credit program in Illinois, and found that not only did all students report benefit, but that tuition savings ranging from $5,000-$24,000 were attained. Smith (2007) administered a short survey to high school seniors at three different high schools in a Kansas school district. Variables assessed included educational aspirations, parental education, self-value of education, and dual credit enrollment information. Smith (2007) found that dual credit enrollment was comprised of students with higher educational aspirations than students who did not enroll, but gave no indication of whether the program actually helped students achieve greater college success. Other research regarding dual credit programs either explains the purpose and rationale of the program without evaluation, and/or describes models of program development and administration. There is scant research indicating whether dual credit programs achieve the goals they are designed to achieve: smooth college transition, reduced time-to-degree, and reduced college cost. Research on the efficacy of dual credit programs at achieving

stated objectives is critical to determining the role and value of dual credit programs in the future.

Need for Further Study

There is a scarcity of dual credit research available, partially due to the recent and rapid increase in the use of dual credit (Marshall & Anders, 2002; THECB, 2008a). Literature that does exist is often focused on a single dual credit program and/or assesses only parts of the program, rather than the program as a whole. Other dual credit literature examines local program impact, program design and implementation, or administration. There is a significant need for research determining whether dual credit is beneficial to students pursuing baccalaureate degrees as the population and college-going rate increase. Research on dual credit will benefit students, institutions, and professionals.

Importance of Further AP and Dual Credit Research

In recent years, efforts to increase college-going rates have been successful, and college-going rates are expected to continue rising for the foreseeable future, along with the U.S. population growth (NCES, 2008). Much of this growth is due to explosive growth in the Hispanic population—fifty percent of the recent population growth (Schmidt, 2003). By 2025, Hispanic children will account for 93% of the growth in the school-age population. These figures are important to the study of AP and dual credit because Hispanic individuals are the most underrepresented of any racial or ethnic group in higher education in the United States, making up only 6.6% of four-year enrollments, although they make up 18% of the college-age population. Hispanic students are less prepared for college than others and are less likely to attain a degree, even when they do attend college. If the population estimate of 2025 is correct, the need to increase college going and success is urgent. Though the study of AP and dual credit as a

means to college success is important for all students, it is especially important for those who consistently underperform when compared to their peers, and this necessity is illustrated and underscored by the growth and educational trends in the Hispanic population.

It has become clear that though it is important to increase college attendance, this is not enough. Educators and policymakers must also attend to increasing graduation rates, and to do so, it is important to understand the implications of the academic preparation that students receive. By increasing understanding of popular programs such as AP and dual credit, educators and policymakers can provide the maximum number of students with not only college access, but the tools to be successful. Research with regard to these elective academic programs will aid education at all levels by providing information about the kinds of academic programs that are successful and how successful the programs are in comparison to each other. This knowledge will enable educational professionals and policymakers to determine what programs should receive support and implementation, as well as what programs are currently effective, in order to best assist their students in the attainment of a university degree.

The current research will examine whether AP programs and/or dual credit programs result in greater graduation success. The research will be conducted with institutional data on the 2004 freshman first-time-in-college (FTIC) cohort (3,556 students) at a large public university in Texas. This university is uniquely positioned for valuable research for three reasons: 1) The university is located in the fourth largest metropolitan area in the United States and enrolls greater than 36,000 students, 2) The university has a very diverse population—it is one of only 10 traditional universities in the nation that enrolls greater than 4,000 African American students and greater than 4,000 Hispanic students, and 3) There are 22 community college campuses in

the area served by the university, in addition to several other universities. These characteristics make the results of this paper likely to be generalizable to many other institutions.

RESEARCH QUESTIONS

The study addressed the following research questions:

1. Is there a statistically significant difference in the main effects of program participation by achievement of college graduation within four years?
2. Is there a statistically significant difference in the interaction effects among program participation by achievement of college graduation within four years?

METHODS

Participants

The data from the fall 2004 first-time-in-college (FTIC) provided a sample (n = 3,566) needed to examined to questions. Students in the sample were a cohort from a large public university in Texas. The average student Scholastic Aptitude Test (SAT) score for this cohort was 1092, slightly above the national average of 1026. The average American College Testing (ACT) score was 23, also slightly above the national average of 21. In addition, 21.28% of the cohort was ranked in the Top 10% of their high school class, 49.28% (including the Top 10%) was ranked in the top quarter, and 37.12% was ranked in the second quarter. A total of 86.40% was ranked in the top half of their high school class. Only 12.19% of the cohort was ranked in the third quarter and 1.41% was ranked in the fourth quarter. The racial/ethnic makeup of the fall 2004 freshman FTIC cohort was: Caucasian, 2,485 (69.88%), African American, 442 (12.43%), Hispanic, 410 (11.53%), Asian, 99 (2.78%), Non-Resident/Alien, 78 (2.19%), and Other, 42 (1.18%). There were 1,493 (41.99%) males and 2,063 (58.01%) females in the fall 2004 freshman FTIC cohort. As shown in Tables 1 and 2, the majority of students (64.0%) did not participate in either program. Following the students who participated in neither, Advanced Placement (AP) had the most program participants, followed by dual credit, then both. Overall, female students participated in the programs at higher rates than male participants. Detailed information about the race/ethnicity, gender, and program participation of the sample cohort is presented in Tables 1 and 2. As shown in Table 3, a total of 694 (19.5%) students graduated in four years or less, and 2,867 (80.6%) students did not graduate within four years. Detailed information about the graduation rates of the sample cohort by program is presented in Table 3, and shows that the majority of students graduating in four years did not participate in a program,

followed by AP participants, dual credit participants, and participants of both programs. Detailed information about the graduation rates of the sample cohort by race/ethnicity is presented in Table 4, and shows that Caucasian students represented the majority of graduates, followed by Hispanic students and African American students.

Measures

Data was collected from the university's Department of Institutional Research. The independent variables included program participation, gender, and race/ethnicity. Program participation was defined as participation in AP courses and/or exams, participation in dual credit programs, participation in both AP and dual credit programs, or participation in neither program. These groups were mutually exclusive and no student was able to be in more than one group. Gender was defined as male or female, and race/ethnicity included African American, Asian, Caucasian, Hispanic, Non-Resident/Alien, and Other. The dependent variable for the present research was four-year graduation. This study considered four-year graduation as those who began college in the fall of 2004 and graduation in or before August of 2008.

Procedures

After receiving data from Department of Institutional Research, data was evaluated using a three-way between-subjects analysis of variance (ANOVA), including a descriptive analysis, Levene's test of homogeneity of variance, ANOVA, and a Scheffe post-hoc analysis. ANOVA was chosen for its inferential power. Levene's test was used to assess between-groups variance because the groups in the sample were unequal. Post-hoc analyses were conducted because while ANOVA can identify that differences are present, it cannot identify where the differences lie. The post-hoc analyses indicate where, among the variables, the differences are located.

The research questions in this study only address the outcomes of program participation, however, due to consistent indications of gender and race/ethnicity discrepancies in college graduation rates, gender and race/ethnicity were included as supplemental analyses (KewalRamani, Gilbertson, Fox, & Provasnik, 2007; Peter & Horn, 2005).

RESULTS

A three-way between-subjects ANOVA conducted at the .05 alpha level was used to evaluate four-year graduation achievement by program participation, gender, and race/ethnicity. It is an assumption of ANOVA that all groups have equal variance (homogeneity of variance). As shown in Table 5, a Levene's test of homogeneity of variance with a $p < .01$ found the current dataset to be in violation of the assumption of homogeneity of variance. The violation of this assumption acts as a warning rather than a disqualifier, and the skewness and kurtosis were checked to determine whether the data presented a normal distribution (George & Mallery, 2007). As shown in Table 6, skewness and kurtosis represent a normal distribution, indicating that the data was not unusual and therefore the ANOVA analysis was accepted as valid. However, caution was still exercised with regard to interpreting the data due to the violation of the assumption of homogeneity of variance, and as suggested by George and Mallery (2007) the Scheffe post-hoc test was chosen to evaluate differences among the variables due to its conservative nature.

ANOVA results as shown in Table 7 indicated that there was a statistically significant main effect of program participation F (3, 3509) = 3.844, p = .009. No other significant main effects were identified. Post-hoc analyses indicated where the differences among programs lie. Results of the Scheffe post-hoc analysis for differences between programs are presented in Table 8. The analysis indicated that Advanced Placement (AP) students graduated at significantly higher rates than dual credit students and students who did not participate in either program. As for dual credit students, they graduated at significantly higher rates than students who did not participate in either program. Students who participated in both AP and dual credit programs graduated at significantly higher rates than students who did not participate in either program.

The analysis also showed a statistically significant interaction effect between gender and race F (5, 3509) = 2.710, p = .019. While findings were statistically significant, effect sizes were small for both the main effect of programs and for the interaction effect between race and gender (η^2 = .003, η^2 = .004, respectively). Results indicating differences for the interaction of gender and race show that females tended to graduate at a higher rate than males, particularly for students who ethnically identified themselves as Other, African American, and Caucasian. The interaction effect occurred with students who identified themselves as Non-Resident. For this group, typically made up of international students, male students graduated at higher rates than female students. This result is shown in Figure 1. The parallel lines indicate no gender/race interaction, while the intersecting lines indicate the occurrence of the gender/race interaction effect.

DISCUSSION

Discussion of Findings

The three-way ANOVA indicated that main effect of program participation accounted for a statistically significant difference in graduation, with AP students graduating at higher rates than both dual credit students and students who did not participate in either program, dual credit students graduating at higher rates than students who participated in neither program but lower rates than AP students, and students in both programs graduating at significantly higher rates than students who participated in neither program. Students in neither program graduated at statistically significantly lower rates than students in AP, dual credit, or both programs. In sum, AP students appear to achieve higher rates of graduation than students in any of the other groups, although students who participated in dual credit or in both programs also graduated at higher rates than students who did not participate in either program. These results imply that AP contributes more heavily to four-year graduation rates than dual credit and certainly more than no participation. Although the main effect for program participation was significant, the effect size was very small. It may be concluded that the impact of program participation is not sufficiently large enough to account for the substantial differences on graduation rates among students in the present sample, however, the effect was significant and the effect size may increase with a larger sample size.

These findings support Adelman (1999) who found that high school curriculum and AP in particular were strongly correlated with bachelor degree attainment. Findings also support Hargrove, Godin, and Dodd (2007), who found that students in AP courses outperformed those that did not participate. A primary difference, however, is that Hargrove, Godin, and Dodd (2007) also examined students who participated in both AP courses and exams, and found those

students to far outperform any other group, including the course-only group. The present research did not consider AP exam participation. When considering the small effect size of the program, present results also appear to support Geiser & Santelices (2004) statement that AP is not an appropriate indicator of a student's potential for success. It should be noted that all of these researchers included samples much larger than the one used in the present study, ranging from several cohorts to nationwide. It is possible that with further research using a larger sample size, the effect size found in the present research would increase, and therefore support findings that indicate the positive impact of AP programs on college outcomes.

Additional analyses performed with race/ethnicity and gender as contributing factors indicated a significant interaction effect between gender and race. Figure 1 represents the interaction effect between race and gender. In this graphical representation, parallel lines indicate no interaction effect and intersecting lines indicate an interaction effect. Results indicated that female students, particularly female students who identified themselves as belonging to Other, African American, or Caucasian groups graduated at higher rates than male students in those same ethnic groups. The interaction effect occurs among Non-Resident students, and for this group, males graduated at higher rates than females. Results of the present research support previous findings that female students trend toward graduating at higher rates than male student, particularly for ethnic/racial minorities (KewalRamani, Gilbertson, Fox, & Provasnik, 2007; Peter & Horn, 2005). Effect size for the significant finding between gender and race was very small. This indicates that like the main effect for program, while the interaction effect between race and gender is statistically significant, its effect on graduation rate appears to be inconsequential for the present sample, although this effect may also become more pronounced with a larger sample size.

Although many researchers have focused on GPA and/or course grades and student retention, the ultimate goal for most new-from-high-school students (the group focused on in the present research) is not grades or retention. The ultimate goal is college graduation. AP and dual credit programs both have goals of preparing students for college, and it is important to research whether these programs contribute to college graduation. The implications of the programs contributing to (or not contributing to) college graduation are wide-spread, including academic, admissions, and economic policies. If findings consistently replicate results supporting AP and/or dual credit programs, the implication is that researchers would then need to find out what features of the programs contribute to college graduation and try to make them available or replicate them for a wider variety of students. Alternatively, if AP and/or dual credit programs are consistently shown not to contribute, then steps toward reform should be taken. These findings extend to the weight placed on AP and dual credit programs with regard to the assignment of college credit and/or placement. If the findings support AP and/or dual credit programs, then the current policies are likely appropriate; if not, the policies should be revised to more accurately place students and assign credit in the most beneficial way for students and institutions. Admissions policies are also implicated as a result of research, similar to the way that placement and credit are implicated. If research consistently supports AP and/or dual credit programs, admissions policies are likely appropriate, although the discussion regarding low-income and racial/ethnic inequality with regard to educational opportunity and admission policies becomes even more relevant. Additionally, millions of dollars in federal and state funds have been expended to increase the availability of and participation in AP programs, and many states support and even require dual credit options in high schools (Andrews, 2001; Kyburg, Hertburg-Davis, & Callahan, 2007). Like other implicated policies, if research consistently

shows that AP and/or dual credit programs contribute to college graduation, the funding allocations are likely appropriate; however, if research shows that the programs do not contribute, whether the funding could be used in more cost-effective ways becomes a more relevant topic of study.

It is possible that the programs have the potential to increase graduation rates but that there are other contributing factors. Other factors that could be explored include the schools attended, AP exam participation and/or scores, dual credit grades, and the number of AP and/or dual credit courses taken.

Recommendations for Future Research

Including six-year graduation rates in research on the effect of participation in AP and/or dual credit programs would be beneficial for adding to the value and practical use of the current research. Due to a change in systems for storing historical data, the freshman cohort from the fall of 2004 was the earliest accessible cohort for the present research. Accessibility of six-year graduation rates would provide a more complete picture of the influence of the programs on graduation rates both earlier than average (four years) and average (five to six years). Additionally, there may be other aspects that are strongly related to college graduation that were not considered in the present research. These include, but are certainly not limited to: AP exam participation and/or scores, dual credit grades, the number of AP and/or dual credit courses taken, subject areas of AP and/or dual credit courses taken, high school curriculum, quality of high school faculty, parental wealth and/or income, parental education, and student attributes. Finally, the use of an ANOVA to evaluate differences including gender as a variable created some limitation. Gender cannot be evaluated in a post-hoc test, and it is difficult to determine where significant differences lie on the interaction effect between gender and race. The use of a

statistical method more suited to consideration of gender as a variable in an interaction effect may provide more clarity with regard to this difference.

Conclusion

Due to the expanding population and increased college-going trends, AP and dual credit programs are popular for their goals of preparing students for college, earning college credit, and gaining advantages in the college admissions process. These programs are supported verbally and financially by federal and state governments and educational professionals. Previous research on these programs has found mixed results with regard to the success of the programs at achieving their stated goals and objectives. Previous research has also been typically limited in scope, often focusing on small components of the program that purportedly indicate whether the programs are successful. This is particularly true of dual credit program research. Examples include grades, exam scores, and/or the number of courses or exams taken. The current research examined the programs in their entirety, using only participation as a variable. Findings indicated that students who participated in AP graduated at higher rates than other program participants, followed by students who participated in dual credit and both programs. Additional analyses examined the role of gender and race/ethnicity and found that the interaction effect between gender and race was significant. Small effect sizes indicate that a larger sample size, similar to that used in other research should be used, and that there may be other contributors to the achievement of four-year graduation that have not been examined in the present research. Implications include the appropriateness of the current use of AP and dual credit programs by post-secondary institutions as well as the designation of federal and state funds supporting student success initiatives. Recommendations for future research include the consideration of six-year graduation rates, larger sample sizes, and the consideration of other variables that may

contribute to college graduation. Present findings were significant and indicated that students who participated in AP, dual credit, or both graduated at higher rates than students who did not participate.

Table 1

Descriptive Statistics for Program, Gender, and Race/Ethnicity

Program	Gender	Race/Ethnicity	Mean	*SD*	*n*
AP	F	African American	.37	.496	19
		Asian	.60	.516	10
		Caucasian	.37	.484	331
		Hispanic	.30	.464	56
		Non-Resident	.00	.000	4
		Other	.33	.516	6
		Total	.36	.482	426
	M	African American	.07	.267	14
		Asian	.08	.289	12
		Caucasian	.26	.441	209
		Hispanic	.31	.471	29
		Non-Resident	.20	.447	5
		Other	.00		1
		Total	.25	.433	270
	Total	African American	.24	.435	33
		Asian	.32	.477	22
		Caucasian	.33	.471	540
		Hispanic	.31	.464	85
		Non-Resident	.11	.333	9
		Other	.29	.488	7
		Total	.32	.466	696
Dual Credit	F	African American	.26	.448	34
		Asian	.40	.548	5
		Caucasian	.27	.444	235
		Hispanic	.26	.447	27
		Non-Resident	.00		1
		Other	.33	.577	3
		Total	.27	.444	305

(*table continues*)

Table 1 (*continued*).

Program	Gender	Race/Ethnicity	Mean	*SD*	*n*
Dual Credit (con't.)	M	African American	.25	.447	16
		Asian	.00		1
		Caucasian	.19	.394	121
		Hispanic	.23	.430	26
		Non-Resident	.50	.707	2
		Other	.00	.000	4
		Total	.20	.401	170
	Total	African American	.26	.443	50
		Asian	.33	.516	6
		Caucasian	.24	.429	356
		Hispanic	.25	.434	53
		Non-Resident	.33	.577	3
		Other	.14	.378	7
		Total	.24	.430	475
Both AP and Dual Credit	F	African American	.67	.577	3
		Asian	.00		1
		Caucasian	.33	.476	54
		Hispanic	.44	.527	9
		Non-Resident	.00		1
		Other	.00	.000	0
		Total	.35	.481	68
	M	African American	.00		1
		Asian	.00		1
		Caucasian	.29	.462	34
		Hispanic	.75	.500	4
		Non-Resident	1.00		1
		Other	.00		1
		Total	.33	.477	42
	Total	African American	.50	.577	4
		Asian	.00	.000	2
		Caucasian	.32	.468	88
		Hispanic	.56	.519	13
		Non-Resident	.50	.707	2
		Other	.00		1
		Total	.35	.478	110

(*table continues*)

Table 1 (*continued*).

Program	Gender	Race/Ethnicity	Mean	*SD*	*n*
Neither AP or Dual Credit	F	African American	.16	.368	206
		Asian	.09	.284	35
		Caucasian	.18	.388	833
		Hispanic	.18	.385	139
		Non-Resident	.09	.288	34
		Other	.24	.437	17
		Total	.18	.381	1264
	M	African American	.06	.239	149
		Asian	.21	.410	34
		Caucasian	.10	.305	668
		Hispanic	.08	.264	120
		Non-Resident	.07	.254	30
		Other	.00	.000	10
		Total	.09	.293	1011
	Total	African American	.12	.323	355
		Asian	.14	.355	69
		Caucasian	.15	.356	1501
		Hispanic	.13	.338	259
		Non-Resident	.08	.270	64
		Other	.15	.362	27
		Total	.14	.347	2,275
Total	F	African American	.19	.397	262
		Asian	.22	.415	51
		Caucasian	.25	.431	1,453
		Hispanic	.23	.421	231
		Non-Resident	.08	.267	40
		Other	.27	.452	26
		Total	.23	.424	2,063
	M	African American	.08	.269	180
		Asian	.17	.377	48
		Caucasian	.15	.359	1,032
		Hispanic	.15	.359	179
		Non-Resident	.13	.343	38
		Other	.00	.000	16
		Total	.14	.348	1,493

(*table continues*)

Program	Gender	Race/Ethnicity	Mean	*SD*	*n*
Total (con't.)	Total	African American	.15	.355	442
		Asian	.19	.396	99
		Caucasian	.21	.405	2,485
		Hispanic	.20	.397	410
		Non-Resident	.10	.305	78
		Other	.17	.377	42
		Total	.20	.396	3,556

Table 2

Program Participants by Gender and Race/Ethnicity

Race/Ethnicity	**Total FTIC 2004 Cohort**		**AP**		**Dual Credit**		**Both**		**Neither**	
Male/Female	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**
Caucasian	1032 (41.5%)	1453 (58.5%)	209 (20.3%)	331 (22.8%)	121 (11.7%)	235 (16.2%)	34 (3.3%)	54 (3.7%)	668 (64.7%)	833 (57.3%)
African American	180 (40.7%)	262 (59.3%)	14 (7.8%)	19 (7.3%)	16 (8.9%)	34 (13.0%)	1 (0.6%)	3 (1.1%)	149 (82.8%)	206 (78.6%)
Hispanic	179 (43.7%)	231 (56.3%)	29 (16.2%)	56 (24.2%)	26 (14.5%)	27 (11.7%)	4 (2.2%)	9 (3.9%)	120 (67.0%)	139 (60.2%)
Asian	48 (48.5%)	51 (51.5%)	12 (25.0%)	10 (19.6%)	1 (2.1%)	5 (9.8%)	1 (2.1%)	1 (2.0%)	34 (70.8%)	35 (68.6%)
Non-Resident	38 (48.7%)	40 (51.3%)	5 (13.2%)	4 (10.0%)	2 (5.3%)	1 (2.5%)	1 (2.6%)	1 (2.5%)	30 (78.9%)	34 (85.0%)

(table continues)

Table 2 *(continued).*

Race/Ethnicity	**Total FTIC 2004 Cohort**		**AP**		**Dual Credit**		**Both**		**Neither**	
Male/Female	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**
Other	16 (38.1%)	26 (61.9%)	1 (6.3%)	6 (23.1%)	4 (25.0%)	3 (11.5%)	1 (6.3%)	0 (0.0%)	10 (62.5%)	17 (65.4%)
Subtotal	1493 (42.0%)	2063 (58.0%)	270 (18.1%)	426 (20.6%)	170 (11.4%)	305 (14.8%)	42 (2.8%)	68 (3.3%)	1011 (67.7%)	1264 (61.3%)
Total	**3,556 (100%)**		**696 (19.6%)**		**475 (13.4%)**		**110 (3.1%)**		**2,275 (64.0%)**	

Table 3

Four-Year Graduation Rates by Program

Program	**AP**	**Dual Credit**	**Both**	**Neither**	**Total**
Number/Percent of Graduates	222 (31.99%)	116 (16.71%)	38 (5.48%)	318 (45.82%)	694 (100%)

Table 4

Four-Year Graduation Rates by Race/Ethnicity

Race/Ethnicity	**African American**	**Asian**	**Caucasian**	**Hispanic**	**Non-Resident**	**Other**	**Total**
Number/Percent of Graduates	65 (9.37%)	19 (2.73%)	515 (74.21%)	80 (11.53%)	8 (1.15%)	7 (1.01%	694 (100%)

Table 5

Levene's Test of Equality of Error Variances

F	***df1***	***df2***	***Significance***
17.837	46	3509	.000

Table 6

Skewness and Kurtosis of Data

	N	**Minimum**	**Maximum**	**Mean**	**SD**	**Variance**	**Skewness**		**Kurtosis**	
							Statistic	SE	Statistic	SE
Program	3,556	1	4	3.11	1.242	1.544	-.831	.041	-1.104	.082
Gender	3,556	1	2	1.42	.494	.244	.325	.041	-1.895	.082
Ethnicity	3,556	2	7	3.92	.910	.828	-.277	.041	1.877	.028
Graduation	3,556	0	1	.20	.396	.157	1.539	.041	.369	.082

Table 7

Analysis of Variance for Four-Year Graduation Rate by Program, Gender, and Race/Ethnicity

Source	***df***	***F***	η^2	***p***
Program	3	3.844**	.003	.009
Gender	1	.806	.000	.369
Race	5	1.197	.002	.308
Program X Gender	3	.688	.001	.559
Program X Race	15	.796	.003	.684
Gender X Race	5	2.710*	.004	.019
Program X Gender X Race	14	1.663	.007	.056
error	3509	(.149)		

Note. Values enclosed in parentheses represent mean square error.
*$p \leq .05$, **$p \leq .01$, ***$p \leq .001$

Table 8

Scheffe Post-Hoc Analysis for Differences Between Programs

Program	**Program**	**Mean Difference**	**SE**	***p***	**95% Confidence Intervals**	
					Lower Bound	Upper Bound
AP	Dual Credit	.07*	.023	.014	.01	.14
	Both	-.03	.040	.931	-.14	.08
	Neither	.19***	.017	.000	.13	.23
Dual Credit	AP	-.07*	.023	.014	-.14	-.01
	Both	-.10	.041	.106	-.22	.01
	Neither	.10***	.019	.000	.05	.16
Both	AP	.03	.040	.931	-.08	.14
	Dual Credit	.10	.041	.106	-.01	.22
	Neither	.21***	.038	.000	.10	.31
Neither	AP	-.18***	.017	.000	-.23	-.13
	Dual Credit	-.10***	.019	.000	-.16	-.05
	Both	-.21***	.038	.000	-.31	-.10

*$p \leq .05$, **$p \leq .01$, ***$p \leq .001$

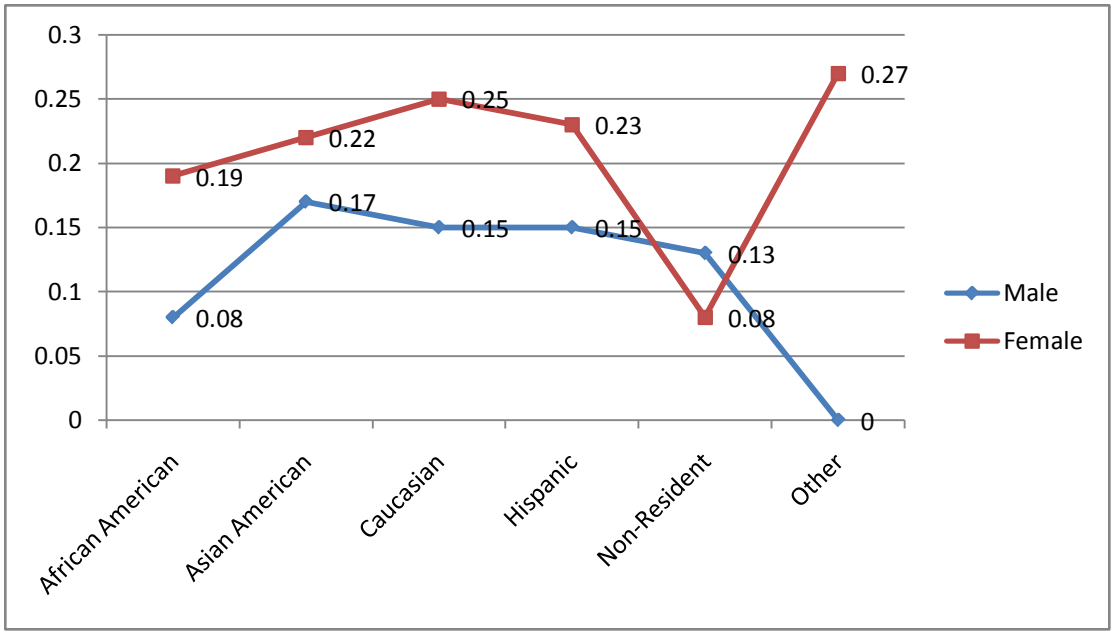

Figure 1. Interaction effect between race and gender.

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